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# Factors Associated with Non-Carious Cervical Lesions (NCCLs) in Teeth

Hina Ahmed, Durr-e-Sadaf and Munawar Rahman

## ABSTRACT

**Objective:** To determine factors associated with Non-Carious Cervical Lesions (NCCLs) and the teeth most commonly involved in such lesions.

**Study Design:** Cross-sectional study.

**Place and Duration of Study:** Department of Operative Dentistry, Section of Dentistry at Aga Khan University Hospital, Karachi, Pakistan, from December 2005 to January 2006.

**Methodology:** A total number of 95 patients with 671 teeth were evaluated using a pre-coded questionnaire. Subject of evaluation was teeth. Patients with symptomatic or asymptomatic NCCLs and permanent dentition were included. Patients exhibiting active, untreatable periodontal disease, rampant uncontrolled caries, xerostomia, primary dentition, patients undergoing orthodontic treatment or bleaching procedure were excluded from the study. Data analysis was done using Spearman's correlation, Mann Whitney test and Kruskal-Wallis test.

**Results:** Mean age of patients was 50.3 years ( $r=0.22$ ,  $p=0.028$ ); males (73%) had more NCCLs than females (23%). Majority (45.3%) of them brushed their teeth twice a day, with medium type of brush (48.4%) and horizontal (73.7%) brushing technique. Most of the patients were non-bruxists (90.5%), with Angles Class 1 occlusion (48.4%) and canine guidance (50.5%). Majority (74.7%) of the patients did not have sensitivity.

**Conclusion:** First premolars in all the quadrants were the most frequently involved teeth in NCCLs. More males had NCCLs. Middle aged patients were more involved. A weak positive correlation was found between age and NCCLs. No association was observed between hand used and site of NCCLs, between wear facets and NCCL, Excursive guidance and NCCL, Angles classification and NCCL.

**Key words:** Non-carious cervical lesions. Tooth wear. Occlusion.

## INTRODUCTION

A Non Carious Cervical Lesion (NCCL) is the loss of tooth structure at the Cement Enamel Junction (CEJ) level that is unrelated to caries. These lesions can affect tooth sensitivity, plaque retention, caries incidence, structural integrity and pulpal vitality.<sup>1-3</sup> The NCCL is being seen with increasing frequency and presents unique challenges for successful restoration. The prevalence of cervical lesions has been reported to be from 5 to 85 per cent in various study populations.<sup>1,4,5</sup> To properly treat such a lesion, it is important to consider its etiology. The cement enamel junction is an area of structural weakness where the enamel layer is at its thinnest.<sup>6</sup> Erosion, abrasion and abfraction are believed to be causative in the formation of NCCLs in this vulnerable area of enamel.<sup>7,8</sup> Erosion is the chemical dissolution of tooth structure by acids, which can be intrinsic or extrinsic in origin. Abrasion is the mechanical wear of tooth structure by repeated physical contact

principally by tooth brushes and/or abrasive dentifrices.<sup>1,9,10</sup> Abfraction is loss of tooth structure when the cervical fulcrum area of a tooth is subject to unique stress torque and moments resulting from occlusal function, bruxing and parafunctional activity.<sup>8,11</sup> These flexural forces can act to disrupt the normal ordered crystalline structure of the thin enamel and underlying dentin by cyclic fatigue, leading to cracks, chips and ruptures.<sup>8,12</sup> The vestibular surfaces can be examined, and recorded by the Tooth Wear Index (TWI) as devised by Smith and Knight.<sup>13</sup>

Occlusion, saliva, age, gender, diet and parafunctional habits are factors that may be associated with non-carious cervical lesions.<sup>7,8,12,14</sup> This study was carried out to determine factors associated with non-carious cervical lesions and to determine the teeth most commonly involved in non-carious cervical lesions.

## METHODOLOGY

This cross-sectional study was carried out over a period of two months from December 2005 to January 2006, with descriptive analysis of lesion characteristics, tooth location and patient demographics. A pre-coded questionnaire was used to collect data from patients visiting Dental Clinics at the Aga Khan University Hospital (AKUH). Data collection was done using

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purposive sampling technique. The total sample consisted of 95 patients and total number of teeth observed was 671. Tooth was the unit of evaluation.

The teeth were divided into four quadrants—upper right quadrant, upper left quadrant, lower left quadrant and lower right quadrant.

Patients with symptomatic or asymptomatic non-carious cervical lesions and permanent dentition were included. Patients exhibiting active, untreatable periodontal disease, rampant uncontrolled caries, xerostomia, primary dentition and patients undergoing orthodontic treatment or bleaching procedure were excluded from the study. Data was collected by the primary investigator. Data collection was done using SPSS version 13.0 and analysis was done using Spearman's correlation, Mann Whitney test and Kruskal-Wallis test. P-value  $\leq 0.05$  was taken as statistically significant.

## RESULTS

Ninety five subjects were examined, who had a total of 671 teeth with multiple NCCLs. Males ( $n=69$ , 73%) were in greater proportion than females ( $n=26$ , 27%). Most of the patients (64%) were between 40-59 years of age with mean age of 50.3 years ( $SE=1.1$  years).

A weak positive correlation was found between age and NCCLs ( $r=0.22$ ,  $p=0.028$ ). Tooth brush and tooth paste was used by 100% of the patients for cleaning the teeth.

Majority (89.5%,  $n=85$ ) of the patients were right handed. No significant association was observed for handedness and site of NCCLs ( $p=0.392$ ).

Mostly patients (48.4%,  $n=40$ ) used medium type of brush followed by soft and hard types. No significant difference was found in lesion and type of brush used ( $p=0.431$ ). Majority of the patients (73.7%,  $n=70$ ) used horizontal brushing technique followed by combination, vertical and circular techniques.

Most of the patients (74.7%,  $n=71$ ) felt no sensitivity to air, with nearly equal numbers between mild (11.6%,  $n=11.6$ ) and moderate (10.5%,  $n=10.5$ ) and only (3.2%,  $n=3.2$ ) had severe sensitivity.

Occlusion was another major characteristic that was examined extensively (Table I). No effect was found of bruxism on non-carious cervical lesions ( $p=0.899$ ). According to Kruskal-Wallis test there was no affect of angles classification on NCCL ( $p=0.168$ ) as well as no significant difference in type of excursive guidance and NCCL ( $p=0.008$ ). Marginally significant association in wear facets and NCCLs in lower right quadrant and significant association in lower left quadrant ( $p=0.008$ ) was found.

First premolars in all the four quadrants were most commonly involved in NCCLs and molars in all the four quadrants were the least commonly involved teeth in NCCLs.

**Table I:** Distribution of occlusal factors studied.

Factor	Percent (n)	p-value
<b>Angles classification</b>		0.168
Class I	48.4 (46)	
Class II	16.8 (16)	
Class III	15.8 (15)	
<b>Wear facets</b>		0.008
Present	33.7 (32)	
Absent	66.3 (63)	
<b>Association habit</b>		0.899
Bruxist	9.5 (9)	
Non-bruxist	90.5 (86)	
<b>Excursive guidance</b>		0.008
Canine guidance	50.5 (48)	
Group function	31.6 (30)	
Mix	17.9 (17)	

## DISCUSSION

It has been found that non-carious cervical lesions are more prevalent with advancing age.<sup>15</sup> This is not surprising because older patients and their teeth have been exposed to the pertinent etiologic factors for a much longer period than younger patients (and their teeth) and thus should be expected to have more lesions.<sup>7,16</sup> In addition, older populations are more likely to have gingival recession and bone loss, with more root surface and cementum exposure, increasing the risk of cervical lesions.<sup>17</sup> In this study, right-handed people had more severe lesions on the opposite side of the mouth, but no significant association was found in type of hand used and site of non-carious cervical lesions, although it is generally thought that right handed people would have more NCCLs on left side and vice versa, literature does not support it either.<sup>18</sup>

A majority (71%) felt no sensitivity to air spray from triple syringe. Non-carious cervical lesion development tends to be a slow, chronic process that occurs over an extended period, therefore, sclerosis and lack of sensitivity was evident in majority of the patients. Secondary dentin deposition, occlusion of open dentinal tubules, pulpal retreat and other natural tooth protective measures slowly adapt to the noxious stimuli and thereby minimize symptoms.<sup>19</sup> These findings are in agreement with other reports that non-carious cervical lesions generally exhibit a lack of thermal sensitivity.<sup>2,12</sup>

Occlusal factors, involving repeated occlusal stresses and tooth flexure, play an important role in non-carious cervical lesion etiology. The majority of affected teeth (48.4%) were in Class I occlusion which concurs with results of other studies.<sup>12</sup> With a Class I occlusion, maximal inter-arch tooth contact in centric occlusion function can occur during maximum intercuspation. The more contact there is between opposing teeth, the more cyclic lateral and compressive forces are exerted at the cervical fulcrum area of the teeth, as occurs during chewing. Bruxing, clenching and other parafunctional habits that increase the magnitude of cervical stress would increase non carious cervical lesion formation.<sup>12</sup>

Some studies show that bruxers have a greater incidence of non-carious cervical lesions than non-bruxers.<sup>11,20</sup> In this study, majority of patients were nonbruxers (90.5%). There was no significant association between bruxism and non-carious cervical lesions, Angles classification and NCCLs and type of excursive guidance and NCCLs.

Wear facets, a sign of stressful occlusion was present in only 33.7% of the subjects with NCCLs but marginally significant association in wear facets and NCCLs in lower right quadrant and significant association in lower left quadrant was found. The presence of wear facets has been a common finding with cervical lesions.<sup>12,21,22</sup> Posterior teeth exhibited more NCCLs, possibly owing to greater occlusal forces and more lateral forces, or to natural relative anatomical morphology of the teeth, periodontium and vestibule.<sup>3,9,12,21</sup> Premolars in this study had the highest prevalence of NCCLs, whereas molars had the lowest prevalence. The finding that premolars are the most susceptible to non carious cervical lesions was also found in other studies.<sup>1,2,7,9,12,23-25</sup> This is due to their anatomical location in the arch.

There are many misconceptions about the etiology of such lesions and substantial differences among dentists in the recognition and treatment of cervical lesions exist.<sup>26</sup> A review of the evidence-based literature can not conclusively establish any one factor as the primary etiology of cervical abrasions because of inherent methodological limitations and conflicting results. Rather, a variety of factors related to tooth brushing may act in concert with dental erosion and, possibly, occlusal loading in the creation of non-carious cervical lesions.<sup>27</sup>

The observations in the study were taken from people with non-carious cervical lesions only. The study was conducted in a tertiary care setting, therefore, results can not be generalized to general population.

## CONCLUSION

Most NCCLs were not sensitive. Occlusion tended to be Class I with canine guidance, with minority of patients having wear facets, and mostly with little or no mobility, lending indirect evidence to an occlusal stress/tooth flexure etiology. Premolars in particular were most likely to have cervical lesions and molars were the least likely. NCCLs and were more likely in older patients and males. A weak positive correlation was found between age and NCCLs. No association was observed between hand used and site of NCCLs.

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